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AGRICULTURAL NEWS LETTER

This publication gives information on new developments of interest to agriculture based on the work done by scientists and agricultural field men of the du Pont Company and its subsidiary companies.

It also gives reports of results obtained with products developed by these companies in the field whether the tests are made by field men of the companies, by agricultural experiment stations or other bodies. Also data on certain work done by agricultural stations on their own account and other matters of interest in the agricultural field.



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GALVANIZED SHEETS USED BY SOUTH AMERICAN FARMERS
TO COMBAT RECURRENT AND RUINOUS LOCUST INVASIONS

EDITOR'S NOTE:- While some readers may know about the method described here for combating locusts in the Argentine, this description of the means employed may offer a suggestion of value.

By Ernest V. Gent, Secretary,
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In certain sections of South America galvanized sheets are not only used to protect farm buildings, but also for war purposes. This is not war between men, but a battle between the farmers in the Argentine and plagues of locusts which threaten to completely demolish all the crops.

The locusts invade the Argentine usually in July and September, fly a certain distance and then alight to lay their eggs in the ground. Having eaten the ground bare around the first camping and nesting place, the swarms fly on, descending at night, eating all they can and then moving forward steadily but surely. At intervals of from 15 to 20 days, the females lay further batches of eggs - eight lots in all - and new armies of locusts literally spring from the ground.

It is these newly-born armies that the farmers fear most and against which all the energy of destructive war is directed. Hatched after 25 to 35 days of incubation in the warm soil, the locust for a limited period is in the larva stage; then it becomes a "hopper," without wings; and at 60 days it is full-grown and fledged with wings. In the hopper stage, it is comparatively helpless against man's attacks; but when winged, it can rise in flight and is safe.

Blocking the Pest's Advance

They are destroyed by the simple but effective means of raising a line of galvanized breastworks across the direction of their advance and then driving them into traps. Here they are usually destroyed by burning, after raking them into piles or throwing them into pits.

The galvanized sheet barrier is a very simple arrangement. The sheets measure 18 x 59 inches. Each sheet is punched with two holes in each end. Through these holes a small metal clamp is inserted to hold the sheets together, and a spike or rod is then run through the clamp to hold the sheets firmly in place. At the same time, this rod serves as a post or support to the barrier, as the sheets are stood on edge, thus forming a low continuous and impenetrable fence or barrier.

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When the Argentine is invaded by locusts, the law compels every landholder to do his part in the work of destruction, the permanent officials supervising, directing and lending their aid with experienced locust fighters and materials for barriers and traps. Inspectors at various towns notify all the farmers when the locusts are coming, and commandeer what labor is required for erecting the galvanized fences. Literally thousands and tens of thousands of tons of these hopper locusts are thus destroyed, the government paying the farmer a small bounty for the "bodies of the slain" at the rate of about 10 cents per hundred pounds.

In 1925 one of the subsidiaries of the U. S. Steel Corporation, to whom I am indebted for much of this detail, shipped 43,000 tons of galvanized sheets to the Argentine for use in the locust battle. Strung end to end, these sheets would extend more than halfway around the world. Since 1925 and right up to the present time, the Argentine Government has purchased additional quantities of galvanized sheets in this country and abroad for the same purpose.

This has proved one of the most unique uses for which galvanized sheets have ever been utilized, and so eminently successful as to command wide attention and interest.

**THE DEVELOPMENT OF PLANT DISEASE CONTROL METHODS
HAS CONTINUED OVER MANY YEARS WITH RAMIFICATIONS**

EDITOR'S NOTE:- This article on the development of methods for controlling plant diseases is certain to be of interest not only to plant pathologists but also all others concerned with the production of farm crops.

By Gilbert F. Miles,
Research Department,
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Wilmington, Delaware

To those of you who now live on farms or who were reared on farms the term "plant diseases" needs no explanation. To those of you, on the other hand, whose only intimate contact with nature is limited to a Saturday afternoon round of golf, the term "plant diseases" may be somewhat vague.

Even though you golfers may not realize it, plant diseases often influence your score. You surely have observed at times spots or patches on the greens where the grass was sickly looking or even entirely dead. Doubtless these spots, known as Brown Patch, have on occasion caused you to miss a putt and thereby added a stroke to your score. Thus, even golfers suffer from the effects of plant diseases, for that Brown Patch spot which ruined your putt is the result of a disease attack on the grass. It is a plant disease.

Don't be too impatient if once in a while during an early morning round of golf, you are held up by a crew of men busily engaged in spraying or sprinkling the greens. They are applying a control measure in the form of a chemical disinfectant, which prevents destruction of the grass by the fungus or mold responsible for Brown Patch. Without the aid of these chemicals applied every week or two, greens would soon be worthless as putting surfaces and frequently would be entirely destroyed.

A grass disease which interferes with your putting may seem serious to you, but consider for a moment a plant disease like late blight of potato which wiped out the potato crop in Ireland in 1845 and resulted in a famine with thousands of lives lost by starvation. Or, recall the wheat stem rust epidemic of 1934, which swept through the great spring wheat territory of the Dakotas and Minnesota like fire across a prairie. Within a month it had almost completely destroyed what promised to be a bumper crop. In that year, 1934, South Dakota farmers planted nearly three million acres of spring wheat. They harvested only a little over 100,000 acres. Stem rust and dry weather had wiped out completely over 95% of the planted acreage.

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As another example we may cite Chestnut blight, which has caused the death of almost all the chestnut trees in the United States. And even now, we are engaged in a death struggle with the Graphium disease, which threatens to eliminate the elms from our forests and parks. These are but a few of many examples of the disastrous effects of plant diseases.

But, enormous as are the losses from such destructive outbreaks, they are far less important economically than those less spectacular losses from crop diseases which occur annually. Stem rot of sweet potatoes, apple scab, cotton root rot, pear blight, potato scab, the smuts of grain - - with these and a host of other diseases the farmer must contend year after year.

The Role of the Plant Pathologist

The causes of plant diseases are numerous and varied. Men sometimes suffer because of too abundant or too scanty a diet; so do plants. Men sometimes suffer from a lack of certain essentials such as vitamins in their food; so do plants. Men sometimes suffer from attacks by fungi or molds; so do plants. Men sometimes suffer from infections by bacteria or germs; so do plants.

The physician has gradually developed methods of combating the ailments of his patients. He may simply decree a change in diet; or in the mode of living; he may resort to drugs or to surgery. He uses disinfectants to destroy dangerous germs and to prevent infections.

Likewise the plant doctor or plant pathologist has developed many methods for preventing and curing diseases of plants. He may prescribe a change in diet for ailing crops, that is, a change in the fertilizer or in the cultural practices. He may use chemicals to disinfect seeds or to provide a protective covering over foliage and fruit to prevent infections by fungi and bacteria. He may employ surgery to remove cankered limbs or branches and thus check the spread of a disease. He may utilize plant breeding methods and create plants resistant or immune to a certain disease.

Developments in Plant Disease Control

The story of the development of these methods for controlling plant diseases is essentially the history of plant pathology. In a brief discussion of this sort it would be impossible even to outline the growth and development of all these plant disease control measures. A better conception of how present day methods have been arrived at will be secured, if we confine our attention to one particular method of controlling diseases and follow its evolution through from earliest times down to the present.

To serve as a typical case we might select, for example, the breeding of plants for resistance or immunity to disease. Varieties of cotton, tomato and water-melon resistant to the wilt diseases, cabbage varieties resistant to yellows, asparagus varieties resistant to rust, wheat varieties resistant to stem rust serve as examples of what can be accomplished in controlling plant diseases by the breeding and selection of plants which do not succumb to certain diseases.

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Another interesting record of the development of methods for controlling plant diseases could be found if we examined that branch of plant pathology which deals with spray fungicides for application to foliage and fruit to prevent infection by fungi or molds. For many years a constant search has been made for improved means of controlling plant diseases in the orchard, the vineyard, the potato field and wherever the use of spray fungicides offers a feasible and economical means of combating diseases.

Or, if we preferred to look into the field of soil disinfection we would be able to observe the progress made in controlling certain soil-borne diseases. This phase of plant disease control probably presents more difficulties to the plant disease investigator than any other field. How, for example, are we to bring under control a fungus which attacks 150 or more different kinds of plants including cotton, and which can live in the soil year after year even though no plants are permitted to grow in the field, and can penetrate into the soil to a depth of 10 or 12 feet or more. This is the problem which confronts those who are endeavoring to check the destructive cotton root rot disease now so prevalent in Texas.

A study of the innumerable failures and the occasional successes which have attended the efforts of scientific workers in the development of any of these methods of combating plant diseases would reveal a thrilling chapter in man's struggle with nature. However, because the principles are more easily grasped, let us select for our study still another means which the plant pathologist uses to control certain diseases -- the treatment or disinfection of seeds. And to simplify matters still more let us confine ourselves to the control of a group of grain diseases which are carried over in the form of spores on the surface of the seeds. Among these diseases we shall find stinking smut or bunt of wheat, two different smuts of oats and covered smut of barley.

The Cause of Smut Diseases of Grain

For those who are not familiar in a general way with these smut diseases it may be well to explain briefly that they are caused by fungi or molds which reproduce themselves and live over from one year to the next by means of microscopic bodies somewhat like seeds, but known as spores.

These spores are often present on the surface of the seed. They are capable under suitable conditions of germinating and infecting the young grain plant. Growing up through the stem of the plant the fungus finally reaches the head and produces there a mass of spores in place of the normal kernel of grain. At threshing time these spore masses or smut balls are broken up and the spores dusted over the grain kernels, the smut fungus thus making certain that when this new crop is sown as seed, the spores will be planted with the wheat and thus repeat the cycle.

Obviously the vulnerable spot in the life history of this smut fungus is the stage which it passes in the form of spores on the surface of the seed. If we treat or disinfect the seed before planting with a chemical strong enough to kill the smut spores without at the same time injuring the seed, we have cut

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the life line of the fungus and our wheat crop will be free from smut. Using this principle, modern seed disinfectants provide almost 100% control of these smut diseases at a cost of less than two cents per bushel of seed grain treated. The production of more efficient and less expensive seed disinfectants has been accompanied by the development of mechanical equipment for treating seed more rapidly. It is now possible to disinfect 500 bushels of wheat per hour with inexpensive seed treaters operated by gravity.

But such simple yet efficient and inexpensive practices were not developed until after numerous methods had been tried and in some cases used for many years before being replaced in turn by still better methods.

When and where and how the grain smuts originated we do not know. Certainly they have been in existence for at least several hundred years. We find reports of heavy losses from smut in England in the 17th century. The malady was thought by some to be due to a too rich or an over-abundant diet of the wheat plant. In other words, the trouble was the result of high living. Others no doubt blamed it on too wet weather or too dry weather. At any rate no one had the slightest conception of the nature or the origin of the smut diseases.

Seed Treatment an Accidental Discovery

Accident frequently plays an important role in the discovery of better ways of doing things, and it seems to be true that an accident was largely responsible for teaching man how to control smut. About the year 1670 a sailing vessel loaded with wheat encountered a storm and ran aground near Bristol, England. Farmers living along the coast salvaged some of the grain, found it too saturated with sea water to use for flour, but planted it for seed. Probably one farmer, a keener observer than his neighbors, noticed that the wheat produced by the salvaged seed was fairly free from smut while nearby fields grown from normal seed were heavily smutted. We can well imagine that his fellow farmers laughed heartily when he suggested that maybe the soaking of the seed in sea water was responsible for the lower amount of smut. Quite probably he resolved secretly to try soaking his seed wheat in sea water before planting. Whether he followed good experimental practice and left some of the seed untreated as a control or check we do not know. But we do know he must have succeeded in proving to his fellow farmers that soaking seed wheat in sea water or sprinkling it with brine helped to grow cleaner crops of wheat, for the writings of the next century indicate that the brining of seed wheat was a common practice.

It was not until almost 100 years after the sailing vessel met with disaster, that Schulthuss suggested the use of blue vitriol in place of salt. Thus, for an entire century men treated their seed wheat with salt water before anyone had the curiosity to search for a better way. In this connection it must be remembered also that no one knew why treating seed wheat with a salt solution helped to reduce smut. In the case of severely smutted wheat they undoubtedly noticed that the seed coat was darkened with the black powder from the smutty heads. But it did not occur to anyone to attribute to this black powder on the seed the smutty crop which such seed produced.

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Anton de Bary's Fundamental Contribution

At the beginning of the 19th century, or to be exact in 1807, Prevost in France observed the germination of the smut spores in water and found that a small amount of copper sulfate in the water prevented their germination. His observation really furnished the key to the problem. It was not, however, until 1853 that Anton de Bary, a German botanist, proved that smut was caused by a parasitic fungus living on and at the expense of the wheat plant.

This fundamental discovery by de Bary facilitated the search for more effective means of controlling smut. No longer were the researchers floundering around in the dark; de Bary had provided a light. Scientific workers now understood what was needed to control smut, and why. They could write the specifications for a good seed treatment. It must be a chemical or other agent highly toxic to smut spores and yet non-injurious to the seed. Other desirable features were that the method of applying the treatment must be simple, practical and relatively inexpensive.

While the preparation of a seed treatment meeting these requirements may seem at first glance to offer no great difficulties, the present high degree of efficiency of seed disinfectants has been attained only after years of effort by chemists and biologists in overcoming apparently insurmountable obstacles.

From the time of de Bary's discovery of the parasitic nature of smut and of the role played by the spores on the seed until 1895 the search for a suitable substitute for copper sulphate went on. In addition to the fact that copper sulphate did not always give good control of smut and that it frequently injured the seed, it had another disadvantage. The various methods in use required the soaking of the seed for periods ranging from several minutes to several hours. This made the process slow and laborious, and also necessitated the drying of the seed before it could be planted. Consequently the search for a better seed treating method centered around a product which could be applied more rapidly, and which did not require the soaking and afterwards the drying of the grain.

The Search for Better Seed Disinfectants

It is unnecessary to do more than mention a few of the many treatments which were studied and rejected during this period of nearly half a century. There were numerous modifications of the original copper sulfate treatment. For example a lime bath was used following the soaking period in the copper solution to reduce injury to the seed. All the available compounds of copper were tested without finding any superior to copper sulfate. Sulfur compounds were also examined and one known as liver of sulfur (potassium polysulfide) was used to a limited extent.

In the early 1890's a new chemical treatment was hailed as the answer to the problem. It was formaldehyde, a gas dissolved in water. It had several advantages over copper sulfate. It did not require long soaking periods; merely wetting the seed with the solution was sufficient. It was much more effective than copper sulfate and was effective also against oat and barley smuts. Formaldehyde, following its introduction to this country by Bolley of North Dakota,

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rapidly replaced copper sulfate, although the latter is still in use in some sections of this country.

In the field of science it is almost axiomatic that no product or method is so good that a better one cannot be produced. And so, vast as was the improvement of formaldehyde over copper sulfate for the disinfection of seed, the search for a still better product continued.

So far, scientific workers had directed their studies to products which could be used in water, for it was felt that solubility in water was a necessary requirement.

The Origin of Dust Treatment

And then in 1917 Darnell Smith of Australia suggested the use of copper carbonate applied as a dust treatment. To the shame of some of the searchers it must be said that Darnell Smith's proposal provoked merriment among certain of the investigators. Did he not know, they asked, that copper carbonate was insoluble in water? How then could it be effective against smut spores? One might as well dust the seed with ground glass or talcum powder. But Darnell Smith was right and copper carbonate was introduced as the first successful dust treatment for wheat. The World War stimulated the use of the product, because the armies fighting in Europe made it imperative that we produce as much wheat as possible. Losses from wheat smut could not be tolerated during war times. Every acre must yield its maximum.

Copper carbonate was tested also on oats and barley, but that disinfectant never proved entirely suitable for treating those grains. Being insoluble and non-volatile, copper carbonate could not penetrate under the hulls to reach smut spores hidden there.

Organic Mercury Compounds Introduced

To go back a few years, about 1912 a new group of compounds began to demand the attention of those seeking better ways of treating seed. European scientists seeking new chemicals for use in combating diseases of mankind found that certain organic mercury compounds combined high efficiency in destroying bacteria and spores with relatively little tendency to injure body tissue. Since these were qualities eagerly sought by those studying seed treatment problems, these new organic mercury compounds were tested as seed treatments. The results of the preliminary investigations were so encouraging that scientific workers gave the bulk of their attention to these new compounds. The earliest of these organic mercurials were the mercurated phenols, chemical combinations of mercury and phenol. They were suitable for use only when dissolved or suspended in water. Although these products found almost immediate use for the treatment of vegetable seeds and seed potatoes, the cost of treating seed grain with them was 15 to 20 cents a bushel, a prohibitive amount in comparison with the cost of formaldehyde and copper carbonate.

Naturally the discovery that organic mercurials of the mercurated phenol type possessed certain very desirable qualities led to the preparation by chemists

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of many other organic mercury compounds. Literally hundreds of compounds and thousands of mixtures and modifications of them have been made and studied.

About ten years ago further impetus was given to the seed treatment investigations by the introduction, among others, of the alkyl mercury salts. These were many times more efficient as fungicides than the original mercurated phenols. They were highly effective against the smuts of wheat, oats and barley.

The chief objection to this group of compounds was that the cost of manufacturing was too high to make them available as seed treatments. Made by the usual laboratory process a pound cost a hundred dollars or more. Research chemists finally found a way to manufacture these compounds in large quantities at a fraction of the original cost. Nevertheless the cost of treating seed grain was still 8 to 15 cents per bushel, which was too high to secure general adoption of these chemicals as seed disinfectants.

Up to this time it had been considered necessary to use at least two ounces of a dust disinfectant per bushel of grain. During further studies of these alkyl mercurials it was shown that in the case of volatile mercurials of this type the total amount of dust applied to the seed was relatively unimportant. The important factor was the amount of toxin or actual fungicide applied to the seed. For example, if one gram of a given chemical was sufficient to destroy all the spores in a bushel of seed wheat, it made little or no difference whether that gram of toxin was mixed with a half ounce of the diluent or with five ounces. With this information at hand it was comparatively easy to prepare a dust disinfectant which was effective and yet inexpensive. As stated previously, modern grain treatments of this sort have now reduced the cost of dust treatments to less than two cents per bushel of seed. Furthermore they have eliminated much of the labor and time involved in treating large quantities of seed.

Those English farmers who sprinkled their grain with sea water or their sons who waited for hours while their seed soaked in copper sulfate solution would be amazed at the sight of a modern seed treating plant with seed being treated as it passes down through the modern gravity treater at the rate of 500 bushels per hour. And they would be delighted to be able to walk through acre after acre of grain without finding a single smutted head.

It may seem to some that present day methods of controlling grain smuts have neared the point of perfection. Compared with the old copper sulfate method used by our fathers, there can be no doubt we have traveled far in the direction of the ideal method of controlling smut of grain. But those who live with the problem day after day realize that our children will laugh at our clumsy methods, even as we smile at the idea of sprinkling seed wheat with salt water to control smut.

Plant Disease Control Covers a Wide Range

While this discussion has dealt primarily with the efforts of scientists to control certain smut diseases of grain, it should be remembered that the cereals are only one of many sorts of plants attacked by seed-borne diseases

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which can now be controlled or eliminated by the use of disinfectants. As the grains have their smuts, so has cotton its anthracnose, sore-shin, and angular leaf spot; corn, its root rots and seedling blights; vegetables and flowers, their damping-off; potato, its black scurf and scab. To control each of these and many other seed-borne parasites, science has now placed in the hands of the farmer one or more effective remedies.

The variety and extent of the problems confronting the plant pathologist may be realized if we recall that the use of chemicals for the control of seed-borne diseases represents only one small phase of man's struggle with plant diseases.

Literally thousands of plant diseases call for an entirely different type of control measure. The development of remedies for these purposes has proceeded in much the same fashion as has seed disinfection. The use of sprays for the protection of fruit and foliage, the disinfection of soils, the breeding of resistant varieties of plants, sanitation, crop rotation and fumigation are other interesting chapters in the history of the development of plant disease control measures.

**A NEW APPROACH TO THE FARM GAME PROBLEM
THAT HOLDS REAL PROMISE IN PENNSYLVANIA**

EDITOR'S NOTE:- This, in part, is a radio address given during a Farm and Home Hour program over the coast-to-coast National Broadcasting Company "Blue" network. The plan now in effect in Pennsylvania should commend itself to those in other States who are interested in improving wild game conditions.

By Seth Gordon, Executive Secretary,
Pennsylvania Game Commission,
Harrisburg, Pennsylvania.

Forty years ago Pennsylvania was almost barren of wildlife. But today the Pennsylvania Game Commission, after a long, hard struggle, with the aid of the landowners and others who appreciate the creatures of the wild or enjoy hunting them, can tell a different story. Now we have more game and other wildlife, at least of certain species, than in the days before William Penn and his followers arrived.

As Pennsylvania's wildlife staged a comeback, interest in it grew apace. In 1913 we had 300,000 licensed hunters; in 1935 we issued slightly over 600,000 hunting licenses, one-tenth of all the licensed hunters in the United States, and almost 300,000 fishing licenses were issued. Today Pennsylvania is spending almost \$1,750,000 a year to restore game and fish, and to protect those over-diligent friends of the farmer, the song and insectivorous birds.

I shall take time to tell you about only one important phase of the Pennsylvania Game Commission's forty-year program. Thirty years ago we launched a system of wildlife refuges, surrounded by public hunting grounds. Today 75 cents out of each \$2.00 resident hunting license fee is set aside for this phase of the Commission's work. Our Department of Forests and Waters owns 1,600,000 acres of public lands, and with the money contributed by hunters the Game Commission has bought over 500,000 acres for State Game Lands.

Wildlife Refuges Found Valuable

We now maintain 200 wildlife refuges on these 2,000,000 acres of public lands, the balance being open to public hunting and other recreational uses. Our Pennsylvania wildlife refuges are comparatively small, the aggregate acreage of the 200 refuges being only slightly over 133,000 acres. But up to this time nearly all of these refuges and public hunting grounds have been located in our vast forest country. The forest refuges have benefitted large game mostly, especially deer.

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Since our wildlife refuge system produced such remarkable results for forest game, the Pennsylvania Game Commission decided recently to ascertain whether the same principles applied in the farming regions will produce equally fine results for farm and farm woodlot game, such as bobwhite quail, ringneck pheasants, cottontail rabbits, squirrels, etc. It is hoped also that the tendency to post lands against hunting may be retarded, and that a method may be devised to get the landowners actively interested in improving the wildlife habitat instead of destroying it. Clean farming kills more potential wildlife than the hunters bag in the Fall.

Cooperative Farm Game Refuges

In its new approach to the farm game problem, the Pennsylvania Commission is now developing a series of cooperative farm game refuge projects, with public hunting grounds, by negotiating leases with groups of landowners in eight heavily hunted counties near large centers of population. Each project will contain from 1,000 to 3,000 acres, upon which numerous small refuges, two to twenty acres each, will be established. The balance of each project will be open to hunting, except posted safety zones of 150 yards around all farm buildings to safeguard the landowners' homes and livestock.

The refuge units will be fenced, posted and heavily stocked with game; food strips will be purchased from the farmers or planted by them at the expense of the Commission; and the landowners will be encouraged to improve the habitat for wildlife on the adjacent lands in order that the increased crop may enable them to trap off much surplus game after the hunting season for the Commission to be stocked elsewhere. In many instances the wives and children of cooperating landowners will be encouraged to raise game from eggs or stock furnished to them at a fixed price per head.

This plan provides several methods for compensating cooperating farmers and their boys for aid essential to the success of the program.

In addition to the farm game refuge projects, four large experimental controlled shooting projects are being established to determine the advantages and disadvantages of controlled hunting, the best farm game management processes, the quantity of game that a given area of inter-mixed farm lands will produce, and the number of hunters who can safely be accommodated on a given unit.

The Pennsylvania Game Commission sincerely believes that when the experimental work above outlined has been sufficiently advanced to justify it, the leaders of our 190,000 farmers and the sportsmen will help to spread such processes into every farming section of the Keystone State.

Field Workers Receive Training

Another recent innovation of the Pennsylvania Game Commission is a training school for field workers, in which thirty-five young men selected by competitive examination are now learning the elementals of wildlife management and administration. These men, upon completion of their training, will in reality become

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extension workers capable to show landowners how they may increase the wildlife crop on the farm.

This joint program constitutes a new approach to the farm game problem which holds much promise for the future. Several other states are developing programs of their own with a like end in view. We can have just as much game in America as we want, if we want it badly enough to work for it.

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THE USE OF "CEL-O-GLASS" IN POULTRY HOUSES
BENEFICIAL TO BABY CHICKS AND LAYING STOCK

EDITOR'S NOTE:- The findings reported here afford an excellent example of how commercial research in the development of a product and agricultural experiment station researches in connection with the properties and uses of the product can combine to the profit of an industry, as in the case of the poultry industry.

By W. H. Allen, Director,
New Jersey Institute of Rural Economics,
Rutgers University,
New Brunswick, New Jersey.

With the days growing shorter and winter approaching, most poultry breeders are giving close attention to those factors which are essential to health, comfort, and egg production.

One of these essential factors is sunlight and another temperature, both of which have to be considered in poultry house construction and remodeling. This is one job every poultryman is undertaking at this time of the year.

For years sunlight was observed as important for good results with poultry keeping; but its importance, value, or what part it played was not known until research was carried on in various Experiment Stations during the last 15 years. Before 1920 poultrymen knew that growing baby chicks indoors resulted in poor growth and leg weakness now called rickets. Also, that during the winter months the laying stock produced fewer eggs and many of these were poor in shell texture and did not hatch when placed in an incubator. They also observed that with the coming of spring, longer days, more sunlight, and moderate temperatures these conditions did not occur; but that the chick grew well, egg production was highest, and the health of the stock at its best.

Valuable Facts Revealed by Research

Professor Hughes of Kansas Experiment Station, followed closely by Wood of Vermont and Bethke of Ohio, proved definitely that the factor which poultry was suffering from was the deficiency of Vitamin D. Dr. Hart and his co-workers of Wisconsin found that sunlight and the ultra-violet rays have the same effect as Vitamin D in preventing the development of rickets in chicks. Hughes in Kansas secured better egg production and a higher calcium content in both shell and egg and better hatchability from a pen of laying hens subject to the ultra-violet rays every day than the control pen which did not receive these beneficial rays. He also found that the beneficial action of ultra-violet rays in preventing rickets is due to its action on the chicken.

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The problem of bringing these rays of sunlight into the poultry house so that chicks could be grown and laying stock handled more profitably was the next study of the investigator. It was known that ordinary glass and soil cloth curtains, the material commonly used in windows and openings at poultry houses, excluded practically all the ultra-violet light of sunshine. A number of experiments were carried out using in place of ordinary glass a product recently placed on the market; namely, "Cel-O-Glass," a translucent material reinforced with wire. Dr. Bethke in 1926 reported an experiment in growing chicks which were subjected to direct sunlight, sunlight transmitted through ordinary window glass, and "Cel-O-Glass." It was found that rickets developed in the ordinary window glass chicks in five weeks, whereas the chicks which received sunlight either directly or through "Cel-O-Glass" showed no rickets during the ten weeks of the experiment.

Ultra-violet Rays Transmitted Through "Cel-O-Glass"

Professor Wood of Vermont in 1926 also found that "Cel-O-Glass" allowed normal growth and prevented the development of rickets in growing chicks. Thus, these two workers proved that "Cel-O-Glass" had the power to transmit the ultra-violet rays of sunlight which ordinary glass bars out.

Hart and his co-workers in 1927 showed that ultra-violet light transmitted through "Cel-O-Glass" was practically as good as direct irradiation. Similar results were found to be true by Russell in the New Jersey Experiment Station in 1928. Since these factors were established by early investigators, many more tests have been completed by other investigators which definitely show the importance of sunlight in the development, growth, and normal functioning of poultry.

Temperature tests at the New Jersey Experiment Station in February, 1930, established the fact that houses equipped with "Cel-O-Glass" in comparison with glass averaged 13 degrees warmer than the houses equipped with ordinary window glass when the temperature outdoors averaged 16.8 degrees Fahrenheit for the period. Similar results were obtained by Professor Carner at the Washington State College.

Many experiment stations and the du Pont Company who recognized these established facts have incorporated "Cel-O-Glass" as window material in the poultry house plans which they make available to farmers and poultry raisers every year.

"Cel-O-Glass" is the registered trade name of E. I. du Pont de Nemours & Company for the product described.

NOTE:- An informative booklet, titled "Winter Eggs," offers valuable suggestions on how to increase egg production. Copies may be obtained by addressing requests to the Agricultural News Letter. This booklet is for domestic distribution only.

SOME FACTS AND SUGGESTIONS ON USING EXPLOSIVES
FOR CLEARING FARM FIELDS OF OBSTRUCTING STUMPS

EDITOR'S NOTE:- The practical suggestions given here can be of value to county agricultural agents when called upon by farmers for advice on the use of explosives.

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Dynamite is an extremely useful source of power. It is, perhaps, the most mobile source of power which has ever been developed. It, therefore, has long been recognized as an important aid to the farmer for clearing land and otherwise improving farms physically. Of first consideration in any blasting work is the choice of the explosives to use. In this connection, it is to be kept in mind that back of the development of dynamites for various purposes are years of research by explosives chemists and testing under actual field conditions in all parts of the country. As a result, the user is offered what might be termed "Prescription" explosives, developed specifically for particular blasting operations. By taking advantage of these things, the blaster is assured of efficiency and economy in blasting.

Grades of dynamite usually run from 20 per cent to 60 per cent, although both higher and lower grades can be obtained.

At first, dynamites were straight nitroglycerin, which meant that a, say, 40 per cent dynamite was 40 per cent nitroglycerin mixed with 60 per cent of absorbent. Later, developments of formulas and advances in making explosives resulted in the replacing of some of the nitroglycerin and part of the absorbent with ammonium nitrate and sodium nitrate. Dynamites of this type are known as ammonium dynamites. They have the same strength as the nitroglycerin dynamites, but they are not nearly as fast in action, nor are they as sensitive as the nitroglycerin type. This slower speed offers advantages for certain kinds of blasting, while the lower sensitiveness contributes to safety in handling.

There is a third general classification, known as gelatin dynamites, where in the particles of dynamite, both straight and ammonia, are coated with a gelatinous substance which makes them waterproof. In all three of these subdivisions, there are grades from 20 per cent to 60 per cent.

Things to Consider When Blasting Stumps

A popular misconception is that some dynamites shoot upwards, and that others shoot downward. As a matter of fact, the force of any explosion is exerted equally in all directions. This being the case, an explosive should be loaded

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so that the thing to be destroyed or removed offers the point of least resistance to the escape of the rapidly expanding gases which constitute the explosion.

The best time to do stump blasting is when there is plenty of water in the ground, which is usually the case in the spring and the fall. The reason is that heavy, soggy soil offers more resistance to the force of a blast than does a stump. When the ground is dry it is filled with countless little air pockets, and much of the force of an explosion will be dissipated as a result of this condition. Blasting in dry ground requires from one-half to two-thirds more dynamite to remove a stump of a given size than does shooting in wet ground.

In shooting a stump, it is essential to find the point of greatest resistance, and place the load beneath that point. This requires study of the root system. There is, of course, a wide variation in root systems, ranging from that of the tap-rooted southern pine to the lateral-rooted spruces found in swamps, the roots of which are on the surface.

The type of soil also has a direct bearing on the location of the load of explosive. The lighter the soil, the deeper the dynamite must be placed, as the roots grow deeper than in heavy soil.

There is no rule of thumb that a blaster may follow in determining exactly how much dynamite to use to blast a stump. The obvious reason is because the quantity will vary with the kind of stump, size and condition, and the character of the soil and its condition, not to mention other considerations.

In loading a lateral-rooted stump, care should be taken not to place the dynamite too close under the stump. Unless care is exercised in properly locating the dynamite, the blast is likely to split the stump in several places and leave large roots in the ground where they will be hit by the plow.

Another precaution to be observed is to avoid using too-fast a dynamite, because of the tendency to sheer off roots instead of blowing them out of the ground. An explosive, such as 20 per cent dynamite, exerts a relatively slow heaving force, with the result that a stump and its roots are pushed upwards and out of the ground.

The procedure discussed is for blasting lateral-rooted stumps and those with comparatively small tap roots. Pine stumps with long and heavy tap roots require different handling. The best results are secured by making a diagonal hole with a wood auger nearly through the root at a point well below the plow-line, and using a dynamite that will sheer off the root. An explosive that is peculiarly suited to this type of work is available.

NOTE:- Mr. Livingston will be glad to answer any inquiries from readers on stump blasting methods. Booklets on blasting stumps of all types are available and will be sent without charge. These booklets are for domestic distribution only.

C O N T R I B U T O R S

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